IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of : SHPAK
Serial No. : 10/764,963 Group Art Unit: 2617
Filed : January 26, 2004 Examiner: Christopher Brandt
For : WIRELESS LAN CONTROL OVER A WIRED NETWORK

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPEAL BRIEF

(1) Real Party in Interest

The subject application is owned by Extricom Ltd., having a place of business at 39 Haim Levanon Street, Tel Aviv, Israel. The assignment was recorded in the U.S.P.T.O. on 2 September 2009, under Reel 023179, Frame 0919.

(2) Related Appeals and Interferences

None.

(3) Status of Claims

This application as filed contained claims 1-54. Claims 22 and 49 were canceled. Claims 1-21, 23-48 and 50-54 are currently pending and were finally rejected in an Official Action dated October 14, 2008.

On April 13, 2009, Appellant appealed from the rejection of claims 1-21, 23-48 and 50-54 (all the claims currently pending in this application).

(4) Status of Amendments

No amendments have been made since the Official Action of October 14, 2008.

(5) Summary of Claimed Subject Matter

In the summary below and throughout this Appeal Brief, paragraph numbers refer to the published version of this application, US 2004/0156399 A1.

One aspect of Appellant's invention, as recited in **independent claim 1**, provides apparatus for mobile communication. Such apparatus is shown generally in Fig. 1. The apparatus includes the following components:

(a) A switch, having a plurality of ports for connection to a wired local area network (LAN). Fig. 1 shows switches 24, 26, which are connected by ports to a LAN 22, as described in paragraph 0045.

(b) A plurality of access points, which are arranged in a wireless local area network (WLAN). Fig. 1 shows WLAN system 20, which comprises multiple access points 30, as described in paragraph 0048. The same paragraph goes on to explain that the access points communicate over the air in accordance with a predefined WLAN protocol with a mobile station 32, also shown in Fig. 1. All the access points operate on a common frequency channel and use a common basic service set identification (BSSID), as described in paragraph 0054. The access points are coupled by the LAN to the switch, as shown in Fig. 1. When one or more of the access points receive an uplink packet transmitted over the WLAN by the mobile station on the common frequency channel, the receiving access points convey messages responsively to the uplink packet over the LAN to the switch, as shown at step 42 in Fig. 2A and described in paragraph 0060.

(c) A manager node, shown as BSSMGR 34 in Fig. 1, which is coupled to the switch so as to receive the messages, as described in paragraph 0049. The manager node is adapted to process the messages so as to select one of the access points to respond to the uplink packet, as shown at step 44 in Fig. 2A and described in paragraph 0062. The manager node sends an instruction via the switch to the selected one of the access points to transmit to the mobile station a response to the uplink packet, as described in paragraph 0069 and shown at step 46 in Fig. 2A. The response is transmitted within a time limit specified by the WLAN protocol, as noted in paragraph 0065 and explained further in the subsequent text.

Independent claim 19 recites apparatus for mobile communication. Such apparatus is shown generally in Fig. 1. The apparatus includes the following components:

(a) A switch, having a plurality of ports for connection to a wired local area network (LAN). Fig. 1 shows switches 24, 26, which are connected by ports to a LAN 22, as described in paragraph 0045.

(b) A plurality of access points, which are arranged in a wireless local area network (WLAN). Fig. 1 shows WLAN system 20, which comprises multiple access points 30, as described in paragraph 0048. The same paragraph goes on to explain that the access points communicate over the air with a mobile station 32, also shown in Fig. 1. The access points are coupled by the LAN to the switch, as shown in Fig. 1. When one or more of the access points receive an uplink packet transmitted over the WLAN by the mobile station on the common frequency channel, the receiving access points convey the uplink message over the LAN to the switch, as shown at step 42 in Fig. 2A and described in paragraph 0060.

(c) A manager node, which is coupled to first and second ports of the switch so as to receive the messages. This configuration is shown in Fig. 1, in which BSSMGR 34 is connected to ports 36 and 38, as described in paragraph 0050. As explained in this paragraph and in paragraph 0085, the manager node is configured to receive uplink messages from the access points exclusively through the first port (port 38), and to convey the uplink messages exclusively via the second port (port 36) over the LAN to respective destination addresses of the message. The manager node has first and second addresses on the LAN, which are respectively associated with the first and second ports, as explained in paragraph 0050. ("Manager 34 thus has two MAC addresses on LAN 22--one associated with port 38 for communication with access points 30, and another associated with port 36 for communication with other nodes.") The access points are adapted to convey the uplink messages over the LAN in the form of data frames directed to the address of port 38, as described, for example, in paragraph 0078.

Independent claim 28 recites a method for mobile communication, which includes the following actions:

(a) A plurality of access points are arranged in a wireless local area network (WLAN) to communicate over the air with a mobile station. Fig. 1 shows WLAN system 20, which comprises multiple access points 30, as described in paragraph 0048. The same paragraph goes on to explain that the access points communicate over the air in accordance with a predefined WLAN protocol with a mobile station 32, also shown in Fig. 1. All the access points use a common basic service set identification (BSSID), as described in paragraph 0054.

(b) One or more of the access points receive an uplink packet transmitted over the WLAN by the mobile station using the common BSSID, as shown at step 40 in Fig. 2A and described in paragraph 0060.

(c) The access points convey messages responsively to the uplink packet over a wired local area network (LAN) linking the access points to a manager node. The connection between the access points, LAN 22, and manager node (BSSMGR 34) is shown in Fig. 1. Conveyance of the messages is shown at step 42 in Fig. 2A and described in paragraph 0060.

(d) The manager node processes the messages so as to select one of the access points to respond to the uplink packet, as shown at step 44 in Fig. 2A and described in paragraph 0062. The manager node then conveys a response instruction to the selected one of the access points, as described in paragraph 0069.

(e) The selected access point transmits a response to the uplink packet to the mobile station responsively to the response instruction, as described in paragraph 0069 and shown at step 46 in Fig. 2A. The response is transmitted within a time limit specified by the WLAN protocol, as noted in paragraph 0065 and explained further in the subsequent text.

Independent claim 46 recites a method for mobile communication, which includes the following actions:

(a) A manager node is coupled to first and second ports among a plurality of ports of a switch in a wired local area network (LAN). This configuration is shown in Fig. 1, in which BSSMGR 34 is connected to ports 36 and 38 of switch 26 in LAN 22, as described in paragraph 0050.

(b) The manager node is assigned first and second addresses on the LAN, which are respectively associated with the first and second ports, as explained in paragraph 0050. ("Manager 34 thus has two MAC addresses on LAN 22--one associated with port 38 for communication with access points 30, and another associated with port 36 for communication with other nodes.")

(c) A plurality of access points are arranged in a wireless local area network (WLAN) to communicate over the air with a mobile station. Fig. 1 shows WLAN system 20, comprising multiple access points 30, which communicate over the air with a mobile station 32, as described in paragraph 0048.

(d) One or more of the access points receive an uplink packet transmitted over the WLAN by the mobile station, as shown at step 40 in Fig. 2A and described in paragraph 0060. The uplink message contains a destination address, as noted, for example, in paragraph 0076.

(e) The access points pass the uplink message over the LAN to the manager node. The connection between the access points, LAN 22, and manager node (BSSMGR 34) is shown in Fig. 1. Conveyance of the messages is shown at step 42 in Fig. 2A and described in paragraph 0060. The messages are conveyed in the form of one or more data frames directed to the first address, via the first port of the switch (port 38), which is configured exclusively to receive uplink messages from the access points. This mode of conveying messages is described, for example, in paragraph 0078. The exclusive use of the first port for such messages is described in paragraph 0050.

(f) The manager node conveys the uplink message via the second port (port 36) over the LAN to the destination address, as shown at step 74 in Fig. 2B and described in paragraph 0085. As explained in paragraphs 0050 and 0085, the switch is configured to convey the uplink messages to respective destination addresses exclusively via the second port.

<u>(6) Grounds of Rejection to be Reviewed on Appeal</u>

Claims 1-18 and 28-45 were rejected under 35 U.S.C. 103(a) over Bajic (U.S. Patent Application Publication 2003/0227893) in view of Melpignano et al. (U.S. Patent Application Publication 2003/0003912) and further in view of Mangold et al. (U.S. Patent Application Publication 2002/0093929). Claims 19-27 and 46-54 were rejected under 35 U.S.C. 103(a) over Bajic in view of Melpignano and further in view of Fox (U.S. Patent 5,787,085). In light of the previous cancellation of clams 22 and 49, however, the rejection of these claims is moot.

Appellant believes the rejection of claims 1-21, 23-48 and 50-54 should be reversed.

<u>(7) Argument</u>

I. The Section 103(a) Rejection of Claims 1 and 28

a. The problem that is solved by the invention

Appellant respectfully submits that the Examiner erred in maintaining that claims 1 and 28 are obvious over Bajic in view of Melpignano and Mangold.

Existing standards for wireless LANs (WLANs), such as IEEE 802.11, envision that each access point will operate independently, with its own wireless network address, known as a basic service set identification (BSSID). Each mobile station communicates with one, and only one, access point at any given time. To avoid conflicts, which may lead to communication failures, it is important that the service areas of access points that operate on the same frequency channel not overlap. Because only a small number of frequency channels are actually available, it often becomes difficult to provide adequate WLAN coverage (see paragraphs 0005-0006 in the present patent application).

For efficient and reliable operation, the IEEE 802.11 standard requires that an access point respond promptly (within 10-16 μs) to each uplink message transmitted to it by the mobile station (see paragraph 0070, for example). When the mobile station

does not receive a response within the time limit, it seeks to establish (or re-establish) contact with an access point by periodically retransmitting the uplink message.

In typical WLAN installations, the access points in a certain area are connected by a wired LAN, such as an Ethernet LAN, to a gateway providing Internet access. Ethernet LANs of this sort provide high overall throughput, but they can be subject to long latency due to traffic conditions on the LAN. In other words, all the data transmitted by the access points will be conveyed over the LAN, but there may be some delay in response time – typically longer than the response time limits defined by WLAN protocols.

As explained in the specification (paragraphs 0009-0010, for example), the invention of claim 1 addresses the need to provide better WLAN coverage, subject to the constraints of existing standards and infrastructure. In other words, the invention seeks to support existing, standard mobile stations and to use a conventional LAN to connect the access points. The claimed invention achieves this objective by configuring a group of access points in a WLAN to use the same BSSID and operate on the same frequency channel, so that they appear to the mobile stations as though they are a single, distributed access point and thus provide dense wireless network coverage. To make this distributed operation possible, the access points are controlled by a central manager node, with which they communicate over a LAN.

The problem remains in this configuration, however, that because of the long latency of the LAN, the access points may frequently be unable to respond to communications from the mobile stations within the strict time limit set by the WLAN protocol. Whereas a single, independent access point, as envisaged by WLAN standards, can easily respond within the applicable time limit (typically 10-16 μs, as noted above), <u>meeting the time limit in a distributed, LAN-based system is far more difficult</u>.

Claims 1 and 28 recite apparatus and a method for mobile communication that solve this problem. Upon receiving an uplink packet, the access points convey messages over the LAN to the manager node via a switch. The manager node processes the messages so as to <u>select one of the access points to respond to the uplink packet within the time limit specified by the WLAN protocol</u>. A number of specific solutions

to this problem are described in the specification, based on novel operational features in the context of a conventional LAN. These solutions include novel methods of packet fragmentation, prioritization and network configuration.

b. Analysis of the cited art

The references cited by the Examiner do not teach or suggest all of the limitations of claims 1 and 28, and the Examiner has failed to provide any articulated reasoning or rational underpinning to support a legal conclusion of obviousness.

Bajic describes a network architecture in which a switch communicates with multiple repeaters, which communicate with mobile stations using the 802.11 WLAN protocol (paragraphs 0045-0047). The Examiner considered Bajic's switch 301 to be equivalent to the manager node in claim 1, and repeaters 302 to be equivalent to the access points, but acknowledged that Bajic fails to teach that his switch could operate in the manner recited in claim 1 while meeting the time limit imposed by the WLAN protocol.

Melpignano describes radio communication arrangements in which a master unit (access point AP) holds information about the topology of a shared resource network. During handoff of a slave unit (mobile terminal MT) from one master unit to another, the first master unit activates a paging procedure by the second master unit (abstract). Thus, each of Melpignano's mobile terminals communicates at any given time with only a single access point. As a result, Melpignano clearly could not teach or suggest the features of operation of the manager node that are set forth above.

In fact, Melpignano teaches that a time limit for response should be <u>intentionally allowed to expire</u>, <u>teaching away</u> from responding within a specified time limit as recited in claims 1 and 28. In paragraph 0019, for example, Melpignano refers to the manner in which a slave unit (MT) is handed over from one master unit (AP) to another: The original connection between the slave unit and the first master unit is not torn down or released until a new connection is at least under establishment between the slave unit and the next master unit. Once the new connection is established, the original connection may be broken by <u>allowing a preset timeout to expire</u>.

In the present Official Action, the Examiner acknowledged that Melpignano and Bajic do not disclose that a manager node could process messages and then select and send an instruction to one of the access points to transmit a response to a mobile station within the time limit specified by a predefined WLAN protocol, as recited in claims 1 and 28.

Instead, the Examiner maintained that Mangold provides this missing teaching. Mangold describes a system and method for sharing bandwidth between co-located 802.11 and Hiperlan/2 systems in a WLAN (abstract). Mangold's system includes an access point (AP), which is coupled to a plurality of mobile stations and implements both the 802.11 and H2 MAC and PHY functions (Fig. 1, paragraph 0035). To prevent interference between 802.11 and H2 transmissions, the AP contains a "hybrid H2 centralized controller (CC) and a 802.11a/e hybrid coordinator (HC)," referred to by Mangold as a "CCHC," which controls time-sharing of the wireless bandwidth (paragraphs 0009, 0035, 0043). The AP periodically transmits control frames to the stations in the WLAN in order to enforce the desired time sharing (paragraph 0011, cited by the Examiner).

<u>All of the above functions, however, take place within a single access point</u>. Mangold does not teach or suggest any sort of wired LAN or manager node. He does not even relate to time limits within which the access point must respond to an uplink packet from a mobile station. As far as the present patent application is concerned, Mangold teaches no more than the fact that an access point in a WLAN must observe time limits imposed by the WLAN protocol. He provides no teaching that would have been of use to a person of ordinary skill in solving the particular problem addressed by the invention of claim 1: <u>To coordinate the operation of a plurality of access points using a manager node so that one selected access point will transmit a response to an uplink packet within a time limit specified by the WLAN protocol</u>.

In response to the above arguments (made by Appellant in reply to the previous Official Action in this case), the Examiner cited paragraph 0012 in Mangold, which specifies certain timing constraints in use of a wireless channel by an access point. These constraints relate to Mangold's time-sharing system and have nothing to do with

any sort of time limit for transmitting a response to an uplink packet from a mobile station.

c. *Conclusion*

To summarize, the Examiner has failed to make a *prima facie* case of obviousness against claims 1 and 28. The cited art neither teaches nor suggests that a manager node, in the network configuration recited in these claims, should or could perform all the claimed steps within the time limit specified by the WLAN protocol. Although the Supreme Court decision in KSR International Co. v. Teleflex Inc. et al, 550 U.S. 398 (2007) has relaxed the "TSM" test for combining references, it made no change in the requirement that all claim limitations must be taught or suggested by the prior art. The Supreme Court noted with approval In re Kahn, 441 F. 3d 977, 988 (CA Fed. 2006), which stated that "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." The Examiner has failed to articulate any such reasoning. The rejection of claims 1 and 28 should therefore be reversed.

II. *The Section 103(a) Rejection of Claims 19 and 46*

Appellant respectfully submits that the Examiner erred in maintaining that claims 19 and 46 are obvious over Bajic in view of Melpignano and Fox.

Claims 19 and 46 recite apparatus and a method for mobile communication in which a plurality of access points in a WLAN communicate over a LAN with a manager node via a switch. The invention of claims 19 and 46, like claims 1 and 28, addresses the problem of high latency in LAN communications between access points and the manager node, and it provides the following solution: The <u>manager node has a first port used exclusively for receiving uplink messages from the access points, and a second port used for conveying the messages to their destinations</u>. The <u>manager node has first and second addresses on the LAN, which are respectively associated with the first and second ports</u>. This approach enables the manager node to communicate with the access

points with low latency via the first port (as explained, for example, in paragraph 0050 of the specification), without interference from other network traffic, which passes through the second port. The manager node and access points are thus able to meet the WLAN timing constraints described above.

In rejecting claims 19 and 46, the Examiner acknowledged that neither Bajic nor Melpignano teaches the novel port configuration of the manager node recited in these claims, but maintained that Fox provides the missing teachings.

Fox describes a system for optimizing data for transmission using a data collector and data assembler to transmit data blocks containing multiple data packets (col. 2, lines 1-9). In the embodiments described by Fox, these features are implemented in a digital cross-connect (DCC) system, which provides an MxN connection matrix between M input ports and N output ports (col. 1, lines 22-36). Fox shows a local area network (LAN) 22 in Fig. 1, but makes no suggestion that it could be connected to his DCC system (col. 3, lines 29-43). He says nothing at all about access points, uplink messages received by the access points, or addresses on a LAN that might be associated with ports of the DCC system. The only "addresses" that Fox mentions belong to devices to which the MxN is to transmit command data packets (col. 7, lines 3-5), and these addresses are distinct from the input and output port identifiers of the switch itself. Therefore, the relevance of Fox to the invention of claims 19 and 46 is marginal at best.

Furthermore, <u>Fox does not teach or even hint that one of his input or output ports might be used exclusively for any purpose, let alone the purpose of receiving and conveying uplink messages from access points</u> (which do not even exist in Fox's system). The Examiner appears to have ignored this limitation of the claim in his grounds of rejection. On the contrary: The very passage that the Examiner cited (col. 2, lines 10-30) emphasizes the versatility of Fox's MxN switch in connecting any of the input ports to any of the output ports.

In the Response to Arguments on this point in the present Official Action (page 3), the Examiner asserted that Fox's "input ports clearly being the uplink and the output ports clearly being the downlink." The Examiner gave no indication at all, however, as to where this conclusory statement might actually be supported in Fox. In fact, Fox's

DCC is just a generic sort of switching system, which is agnostic to uplink and downlink directions.

Thus, the Examiner has failed to make a *prima facie* case of obviousness against claims 19 and 46, because the cited art neither teaches nor suggests all the limitations of these claims. Once again, the grounds of rejection rely on mere conclusory statements, without rational underpinning to support the legal conclusion of obviousness. The rejection of claims 19 and 46 should therefore be reversed.

III. The Section 103(a) Rejection of Claims 10, 11, 24, 25, 37, 38, 51 and 52

Appellant respectfully submits that even if the independent claims in this application were conceded to be obvious over the cited references, these references still do not teach or suggest the added elements of dependent claims 10, 11, 24, 25, 37, 38, 51 and 52.

The subject claims relate to the length of data frames transmitted over the LAN by the access points, and in particular specify that these data frames are very short. Claim 10, for example, recites that the access points fragment uplink data packets from the mobile station for transmission over the LAN to the manager node into a succession of data frames having a length that is no more than 10% of the maximum frame length permitted on the LAN. Claim 11 recites that the data frames have a length equal to the minimum frame length permitted on the LAN. The reason for fragmenting the data messages is to avoid clogging access to and from the manager node, in order to ensure that the mobile stations receive a timely acknowledgment of their uplink packets, as explained in paragraph 0077 of the specification. The sort of radical fragmentation that is recited in claims 10 and 11 is contrary to the convention wisdom of LAN communications, which tends to prefer long packets for greater overall data throughput.

In rejecting claims 10, 11, 24, 25, 37, 38, 51 and 52, the Examiner referred to paragraphs 116, 117 and 126 (presumably in Bajic). Bajic relates to standard fragmentation and defragmentation functions, but says nothing about the sizes of the fragments. The other references likewise contain no relevant teaching or suggestion that very small fragments might be desirable, as recited in the subject claims.

Thus, the cited references fail to teach or suggest all of the limitations of dependent claims 10, 11, 24, 25, 37, 38, 51 and 52. These claims are therefore independently patentable over the cited art, notwithstanding the patentability of the independent claims.

IV. The Section 103(a) Rejection of Claims 13 and 40

Appellant respectfully submits that even if the independent claims in this application were conceded to be obvious over the cited references, these references still do not teach or suggest the added elements of dependent claims 13 and 40.

Claim 13, for example, recites that the manager node (which communicates with access points via a switch, as stated in claim 1) is connected to two different ports of the switch. The manager node receives fragmented data frames from the access points through the first port and conveys reassembled packets to the LAN via the second port. The importance of using separate ports for communicating with the access points and for communicating with the rest of the nodes on the LAN was explained above in reference to claims 19 and 46.

In rejecting claims 13 and 40, the Examiner stated merely that "the combination of Bajic and Melpignano disclose" the claimed configuration, without pointing to any specific teachings in the references in support of this assertion. In fact, there is not even a hint in either of these references with regard to the use of two different ports together to connect a manager node to a switch. There is similarly no teaching or suggestion of such a configuration in Fox.

Therefore, claims 13 and 40 are independently patentable over the cited art, notwithstanding the patentability of claims 1 and 28.

V. The Section 103(a) Rejection of Claims 17, 18, 44 and 45

Appellant respectfully submits that even if the independent claims in this application were conceded to be obvious over the cited references, these references still do not teach or suggest the added elements of dependent claims 17, 18, 44 and 45.

The claims in question relate to prioritization of messages transmitted from the access points to the manager node. Claim 17, for example, depends from claim 16, which states that each of the access points receiving an uplink packet from a mobile station sends a message to the manager node indicating the strength of the uplink signal that the access point received. The manager node selects the access point that is to respond to the uplink packet based on this indication, even before the manager node has received all of the access point messages. Claim 17 specifies that the access points convey the messages with a priority indicator that is set in response to the uplink signal strength. The priority indicator causes the switch to deliver messages that indicate a strong uplink signal before messages that indicate a weak uplink signal. As a result (as explained in paragraph 0063), the manager node will receive messages reporting strong uplink signals first, and will thus be able to rapidly choose the best access point to respond to the mobile station.

Claim 18 recites an alternative method for achieving the same objective: The access points delay messages reporting a weak uplink signal, relative to messages reporting a strong uplink signal, so that the manager node receives the strong signal messages first.

In rejecting claims 17 and 44, the Examiner again merely asserted that Bajic and Melpignano discloses the claimed feature, without citing any particular passages in the reference. In fact, none of the cited references teach or suggest the sort of message prioritization based on signal strength that is recited in these claims.

In regard to claims 18 and 45, the Examiner held that Melpignano discloses in paragraph 9 that access points may delay transmission of messages over a LAN based on uplink signal strength. Paragraph 9, however, states only the well-known point that a mobile terminal connects to the base station to which it is closest based on a received signal strength indicator (RSSI). The cited references neither teach nor suggest that an access point might apply any sort of delay to message transmission based on uplink signal strength.

Therefore, claims 17, 18, 44 and 45 are independently patentable over the cited art, notwithstanding the patentability of claims 1 and 28.

Summary

For the foregoing reasons, it is submitted that the Examiner's rejection of claims 1-21, 23-48 and 50-54 was erroneous. Reversal of the Examiner's decision is respectfully requested.

Respectfully submitted,

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APPENDIX - CLAIMS

1. Apparatus for mobile communication, comprising:

a switch, having a plurality of ports for connection to a wired local area network (LAN);

a plurality of access points, which are arranged in a wireless local area network (WLAN) to communicate over the air in accordance with a predefined WLAN protocol on a common frequency channel with a mobile station using a common basic service set identification (BSSID) for all the access points, and which are coupled by the LAN to the switch so that upon receiving at one or more of the access points an uplink packet transmitted over the WLAN by the mobile station on the common frequency channel, the one or more of the access points convey messages responsively to the uplink packet over the LAN to the switch; and

a manager node, which is coupled to the switch so as to receive the messages and is adapted to process the messages so as to select one of the access points to respond to the uplink packet, and to send an instruction via the switch to the selected one of the access points to transmit to the mobile station a response to the uplink packet within a time limit specified by the WLAN protocol.

2. The apparatus according to claim 1, wherein the access points have respective service areas, and are arranged so that the service areas substantially overlap.

3. The apparatus according to claim 1, wherein the access points are configured to communicate with the mobile station substantially in accordance with IEEE Standard 802.11.

4. The apparatus according to claim 1, wherein the LAN is an Ethernet LAN.

5. The apparatus according to claim 1, wherein the LAN is characterized by a data transmission rate of at least 1 Gbps.

6. The apparatus according to claim 1, wherein the LAN is characterized by a data transmission rate that is substantially less than 1 Gbps.

7. The apparatus according to claim 1, wherein the manager node has an address on the LAN, and wherein the access points are adapted to convey the messages over the LAN in the form of data frames directed to the address of the manager node.

8. The apparatus according to claim 7, wherein the access points are configured to communicate over the LAN exclusively with the manager node.

9. The apparatus according to claim 7, wherein the uplink packet comprises an uplink data packet, and wherein the access points are configured to fragment the uplink data packet among a succession of the data frames for conveyance over the LAN via the switch to the manager node.

10. The apparatus according to claim 9, wherein the access points are operative to fragment the uplink data packet so that the data frames have a length that is no more than 10% of a maximum frame length permitted on the LAN.

11. The apparatus according to claim 9, wherein the access points are operative to fragment the uplink data packet so that the data frames have a length that is equal to a minimum frame length permitted on the LAN.

12. The apparatus according to claim 9, wherein the uplink data packet comprises a destination address, and wherein the manager node is adapted to reassemble the uplink data packet from the succession of the data frames, and to convey the reassembled packet via the switch over the LAN to the destination address.

13. The apparatus according to claim 12, wherein the manager node is connected to first and second ports among the plurality of the ports of the switch, and is configured to receive the data frames from the access points through the first port and to convey the reassembled packet to the LAN via the second port.

14. The apparatus according to claim 13, wherein the manager node is further configured to receive a downlink data packet from the LAN via the second port, and to fragment the downlink data packet into a further succession of the data frames and to convey the further succession of the data frames via the first port to the selected one of the access points, which is operative to reassemble the downlink data packet for transmission over the WLAN to the mobile station.

15. The apparatus according to claim 9, wherein the address of the manager node on the LAN comprises a Layer 3 address, and wherein each of the succession of the data frames among which the uplink data packet is fragmented comprises a Layer 3 encapsulating packet, having a destination address corresponding to the Layer 3 address of the manager node.

16. The apparatus according to claim 1, wherein the messages conveyed by the access points responsively to the uplink packet comprise an indication of a strength of an uplink signal, conveying the uplink packet, received respectively by each of the

one or more of the access points, and wherein the manager node is adapted to select, responsively to the indication and prior to receiving the messages from all of the one or more of the access points, the one of the access points to respond to the uplink packet.

17. The apparatus according to claim 16, wherein the access points are adapted to set, responsively to the strength of the uplink signal, a priority indicator in the messages to be conveyed over the LAN so as to cause the switch to deliver a first message indicating a strong uplink signal before delivering a second message indicating a weak uplink signal.

18. The apparatus according to claim 16, wherein the access points are adapted, responsively to the strength of the uplink signal, to delay transmission of some of the messages over the LAN, so that a first message indicating a strong uplink signal is transmitted with a smaller delay than a second message indicating a weak uplink signal.

19. Apparatus for mobile communication, comprising:

a switch, having a plurality of ports for connection to a wired local area network (LAN);

a plurality of access points, which are arranged in a wireless local area network (WLAN) to communicate over the air with a mobile station, and which are coupled by the LAN to the switch so that upon receiving at one or more of the access points an uplink message transmitted over the WLAN by the mobile station, the one or more of the access points convey the uplink message over the LAN to the switch; and

a manager node, which is connected to first and second ports among the plurality of the ports of the switch, and is configured to receive uplink messages from the access points exclusively through the first port and to convey the uplink messages exclusively via the second port over the LAN to respective destination addresses of the message,

wherein the manager node has first and second addresses on the LAN, which are respectively associated with the first and second ports, and wherein the access points are adapted to convey the uplink messages over the LAN in the form of data frames directed to the first address.

20. The apparatus according to claim 19, wherein the access points are configured to communicate over the LAN exclusively with the manager node via the first port in response to uplink messages received from the mobile station.

21. The apparatus according to claim 19, wherein the access points are configured to communicate with the mobile station substantially in accordance with IEEE Standard 802.11.

23. The apparatus according to claim 19, wherein the uplink message comprises a data packet, and wherein the access points are adapted to fragment the uplink data packet among a succession of the data frames for conveyance over the LAN to the first address, and wherein the manager node is adapted to reassemble the data packet from the succession of the data frames, and to convey the reassembled data packet via the second port over the LAN to the destination address, using the second address as a source address.

24. The apparatus according to claim 23, wherein the access points are operative to fragment the data packet so that the data frames have a length that is no more than 10% of a maximum frame length permitted on the LAN.

25. The apparatus according to claim 23, wherein the access points are operative to fragment the data packet so that the data frames have a length that is equal to a minimum frame length permitted on the LAN.

26. The apparatus according to claim 23, wherein the address of the manager node on the LAN comprises a Layer 3 address, and wherein each of the succession of the data frames among which the uplink data packet is fragmented comprises a Layer 3 encapsulating packet, which is addressed to the Layer 3 address of the manager node.

27. The apparatus according to claim 19, wherein the manager node is further configured to receive a downlink message from the LAN via the second port, and to convey the downlink message via the first port to one of the access points, which is operative to transmit the downlink message over the WLAN to the mobile station.

28. A method for mobile communication, comprising:

arranging a plurality of access points in a wireless local area network (WLAN) to communicate over the air with a mobile station in accordance with a predefined WLAN protocol using a common basic service set identification (BSSID) for all the access points;

receiving at one or more of the access points an uplink packet transmitted over the WLAN by the mobile station using the common BSSID;

conveying messages responsively to the uplink packet from the one or more of the access points over a wired local area network (LAN) linking the access points to a manager node;

processing the messages at the manager node so as to select one of the access points to respond to the uplink packet, and conveying a response instruction from the manager node to the selected one of the access points; and

transmitting from the selected one of the access points to the mobile station responsively to the response instruction a response to the uplink packet within a time limit specified by the WLAN protocol.

29. The method according to claim 28, wherein the access points have respective service areas, and wherein arranging the plurality of the access points comprises arranging the access points so that the service areas substantially overlap.

30. The method according to claim 28, wherein arranging the plurality of the access points comprises arranging the access points to communicate with the mobile station substantially in accordance with IEEE Standard 802.11.

31. The method according to claim 28, wherein the LAN is an Ethernet LAN.

32. The method according to claim 31, wherein conveying the messages comprises sending the messages over the Ethernet LAN at a data transmission rate of at least 1 Gbps.

33. The method according to claim 31, wherein conveying the messages comprises sending the messages over the Ethernet LAN at a data transmission rate that is substantially less than 1 Gbps.

34. The method according to claim 28, wherein the manager node has an address on the LAN, and wherein conveying the messages comprises transmitting the messages over the LAN in the form of data frames directed to the address of the manager node.

35. The method according to claim 34, wherein the access points are configured to communicate over the LAN exclusively with the manager node.

36. The method according to claim 34, wherein receiving the uplink packet comprises receiving an uplink data packet sent by the mobile station, and wherein transmitting the messages comprises fragmenting the uplink data packet among a succession of the data frames for conveyance over the LAN via the switch to the manager node.

37. The method according to claim 36, wherein fragmenting the uplink data packet comprises generating the data frames with a length that is no more than 10% of a maximum frame length permitted on the LAN.

38. The method according to claim 36, wherein fragmenting the uplink data packet comprises generating the data frames with a length that is equal to a minimum frame length permitted on the LAN.

39. The method according to claim 36, wherein the uplink data packet comprises a destination address, and comprising reassembling the uplink data packet at

the manager node from the succession of the data frames, and conveying the reassembled packet over the LAN to the destination address.

40. The method according to claim 39, wherein the LAN comprises a switch, and the manager node is connected to first and second ports of the switch, and wherein transmitting the messages comprises transmitting the data frames from the access points through the first port to the manager node, and wherein conveying the reassembled packet comprises transmitting the reassembled packet to the LAN via the second port.

41. The method according to claim 40, and comprising:

receiving at the manager node a downlink data packet from the LAN via the second port;

fragmenting the downlink data packet into a further succession of the data frames;

conveying the further succession of the data frames via the first port to the selected one of the access points; and

reassembling the downlink data packet at the selected one of the access points for transmission over the WLAN to the mobile station.

42. The method according to claim 36, wherein the address of the manager node on the LAN comprises a Layer 3 address, and wherein each of the succession of the data frames among which the uplink data packet is fragmented comprises a Layer 3 encapsulating packet, having a destination address corresponding to the Layer 3 address of the manager node.

43. The method according to claim 28, wherein conveying the messages comprises conveying an indication of a strength of an uplink signal, conveying the uplink packet, received respectively by each of the one or more of the access points, and wherein processing the messages comprises selecting at the manager node, responsively to the indication and prior to receiving the messages from all of the one or more of the access points, the one of the access points to respond to the uplink packet.

44. The method according to claim 43, wherein conveying the indication comprises setting, responsively to the strength of the uplink signal, a priority indicator in the messages to be conveyed over the LAN so as to cause the switch to deliver a first message indicating a strong uplink signal before delivering a second message indicating a weak uplink signal.

45. The method according to claim 43, wherein conveying the indication comprises delaying, responsively to the strength of the uplink signal, transmission of some of the messages, so that a first message indicating a strong uplink signal is transmitted with a smaller delay than a second message indicating a weak uplink signal.

46. A method for mobile communication, comprising:

coupling a manager node to first and second ports among a plurality of ports of a switch in a wired local area network (LAN);

assigning to the manager node first and second addresses on the LAN, which are respectively associated with the first and second ports;

arranging a plurality of access points in a wireless local area network (WLAN) to communicate over the air with a mobile station;

receiving at one or more of the access points an uplink message transmitted over the WLAN by the mobile station, the uplink message containing a destination address;

passing the uplink message from the one or more of the access points over the LAN to the manager node, in the form of one or more data frames directed to the first address, via the first port of the switch, which is configured to receive uplink messages from the access points exclusively through the first port; and

conveying the uplink message from the manager node via the second port over the LAN to the destination address, wherein the switch is configured to convey the uplink messages to respective destination addresses exclusively via the second port.

47. The method according to claim 46, wherein arranging the plurality of the access points comprises configuring the access points to communicate over the LAN exclusively with the manager node via the first port in response to uplink messages received from the mobile station.

48. The method according to claim 46, wherein arranging the plurality of the access points comprises arranging the access points to communicate with the mobile station substantially in accordance with IEEE Standard 802.11.

50. (Currently amended) The method according to claim 46, wherein the uplink message comprises an uplink data packet, and wherein passing the uplink message comprises fragmenting the upstream data packet among a succession of the data frames for conveyance over the LAN to the MAC address, and wherein conveying the uplink message comprises reassembling the data packet from the succession of the

data frames, and conveying the reassembled packet via the second port over the LAN to the destination address, using the second address as a source address.

51. The method according to claim 50, wherein fragmenting the uplink data packet comprises generating the data frames with a length that is no more than 10% of a maximum frame length permitted on the LAN.

52. The method according to claim 50, wherein fragmenting the uplink data packet comprises generating the data frames with a length that is equal to a minimum frame length permitted on the LAN.

53. The method according to claim 50, wherein the address of the manager node on the LAN comprises a Layer 3 address, and wherein each of the succession of the data frames among which the uplink data packet is fragmented comprises a Layer 3 encapsulating packet, which is addressed to the Layer 3 address of the manager node.

54. The method according to claim 46, and comprising:

receiving at the manager node a downlink message from the LAN via the second port;

conveying the downlink message via the first port from the manager node to one of the access points; and

transmitting the downlink message over the WLAN from the one of the access points to the mobile station.

APPENDIX B – EVIDENCE

None.

APPENDIX C – RELATED PROCEEDINGS

None.